

**Main Ideas**

Essential Questions	Guiding Questions
1) What is matter composed of?	a) What is chemistry? b) What is matter? c) How are the smallest bits of matter described? d) How can atoms of the same element be different?
2. How can we organize the building blocks of the universe (elements)?	a) What do the chemical names and symbols tell you about matter? b) What happens to elements in a chemical change? c) How is the periodic table organized? d) What information does the periodic table reveal about the elements? e) Why do elements in the same group have similar properties? f) What does the periodic table indicate about the arrangement of electrons? g) Where are the valence electrons in electron configurations? h) What evidence is there that certain elements are present in a compound? i) How are the atoms of one element different from those of another?
3. What holds substances together?	a) How is chemical stability related to the arrangement of electrons in atoms? b) How can valence electrons be used to predict chemical formulas? c) How can you predict chemical formulas and name ionic compounds? d) What is a polyatomic ion? e) How can substances be sorted into general categories? f) How are atoms connected to one another?
4. How can we make new substances with different properties?	a) What are nuclear reactions? b) How are new elements formed? c) What happens to matter when it is changed? d) How can you extract an element from a compound? e) What are signs of a chemical reaction? f) How is matter conserved in a chemical reaction?
5. How can you use the properties of a substance to identify it?	a) How do you determine the masses and volumes of different substances? b) How can you use mass and volume to determine the identity of a substance?

6. How do atoms form molecules?	a) How does one atom bond to another in a molecule?
7. How can you predict the smell of a compound?	a) What does a formula have to do with smell? b) What does the structure of a molecule have to do with smell? c) How are functional groups related to smells?

**Students will know (knowledge):**

1. Chemist's tools
2. Safety rules
3. Early chemistry history
4. Ways to determine volume of a substance
5. Relationship of density and types of matter
6. Difference between matter and non-matter
7. How to describe matter and phases with chemical names and symbols
8. Evidence of a chemical change
9. How periodic table is organized (Mendeleev and modern)
10. How to obtain information from periodic table
11. Periodic trends including similarity of elements in the same group
12. Historic models of the atom
13. Parts and properties of the atom and methods of describing them
14. Compare properties of differing isotopes versus differing elements
15. Relationship of protons and neutrons for stable elements
16. What happens to radioactive(unstable) isotopes
17. Elements have more than one isotope
18. Types of nuclear reactions including types of fission
19. Shielding power of different types of radiation
20. Energy of fission versus fusion
21. How nuclear chain reactions generate power
22. Excited electrons give off light
23. Similarity of properties of elements in same groups
24. Number of valence electrons related to group number (for main-group elements)
25. How chemical stability is related to electrons arrangements in atoms
26. Which elements gain or lose electrons
27. Octet rule
28. Electron shells have subshells holding differing numbers of electrons
29. Types of bonding and their properties
30. Molecules, basis of smells, can be represented using molecular formulas and chemical names.
31. Smells can be predicted using molecular formulas, chemical names, or structural formulas
32. Chemicals with the same molecular formulas can have different structures with different properties called isomers
33. Hydrogen, oxygen, nitrogen and carbon each have tendencies to bond a specific number of times.
34. The rule HONC 1234 helps to build structural formulas from molecular formulas for compounds with these elements
35. Functional groups account for some molecules with similar smells
36. Smells associated with common functional groups (acids, amines, esters, alkanes, alcohol)
37. Smells can be altered by reacting chemical compounds

**Vocabulary Term**

actinides	fusion	theory
alkali metal	gamma ray	tool
anion	group	transition elements
aqueous	half-life	triple bond
cation	halogens	valence electron
chemical name	hypothesis	valence shell
chemical reaction	intensive property	volume
density	ionic compound	water displacement
double bond	lanthanides	
flame test	Lewis dot structure	
ion	Lewis dot symbol	
isomer	lone pair	
isotope	main-group elements	
law of conservation of matter	mass	
mass number	matter	
product	meniscus	
properties	metalloids	
radioactive isotope	metals	
alkaline-earth metal	model	
alpha decay	molecule	
atom	monatomic ion	
atomic mass	neutron	
atomic mass unit (amu)	noble gases	
atomic number	nonmetals	
atomic theory	nuclear equation	
average atomic mass	nuclear reaction	
beta decay	nucleus	
beta particle	octet rule	
bonded pair	parent isotope	
chain reaction	patterns	
chemical change	periodic table	
chemical equation	periods	
chemical symbol	phase	
chemistry	polyatomic ion	
compound	proton	
core electron	radiation	
daughter isotope	radioactive decay	
double bond	reactant	
electron	reactivity	
extensive property	rule of zero charge	
fission	single bond	
	structural formula	